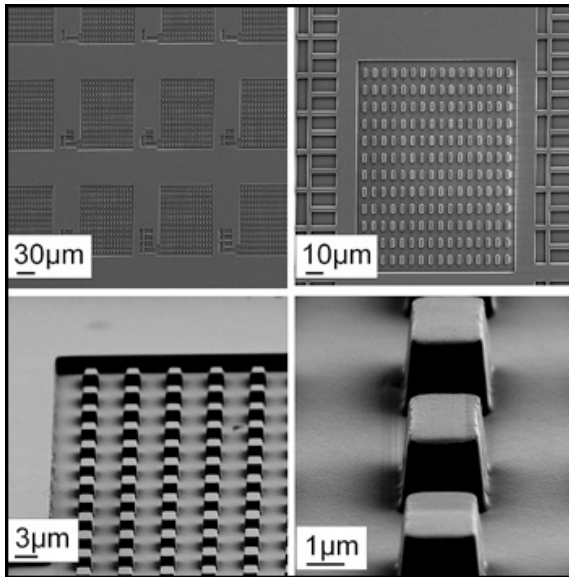


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Featured Story

New Polymer Could Improve Semiconductor Manufacturing, Packaging



In this scanning electron microscope image of PES in a UV-imprint lithography application, the well-defined pattern indicates the material's potential for use in next-generation chip making techniques.

Researchers at Rensselaer Polytechnic Institute and Polyset Company have developed a new inexpensive, quick-drying polymer that could lead to dramatic cost savings and efficiency gains in semiconductor manufacturing and computer chip packaging.

Along with allowing enhanced performance and cost savings for conventional photolithography processes, the new material, called polyset epoxy siloxane (PES), should also enable a new generation of lower-cost, on-chip nanoimprinting lithography technology, according to the researchers.

“With this new material, chip manufacturers will be able to trim several steps from their production and packaging processes, and in turn realize a cost savings,” said Toh-Ming Lu, the R.P. Baker Distinguished Professor of Physics at Rensselaer, who oversaw the study. “PES is cheaper and more reliable.”

Lu's research was published in the *Journal of Vacuum Science and Technology B*.

The widely adopted technique of photolithography involves using a mix of light and chemicals to generate intricate micro- and nano-scale patterns on tiny areas of silicon. As part of the process, a thin polymer film — called a redistribution layer, and crucial to the effectiveness of a device — is deposited onto the silicon wafer, in order to ease the signal propagation delay and to protect the chip from different environmental and mechanical factors.

In addition to Lu, co-authors on the paper include [Pei-I Wang](#) (Research Associate, Center for Integrated Electronics); Omkaram Nalamasu, chief technical officer of Applied Materials Inc. in Santa Clara, Calif.; Rajat Ghoshal and Ram Ghoshal of Polyset Co. Inc. in Mechanicville, N.Y.; Charles Schaper of Transfer Devices Inc. in Santa Clara, Calif.; and Andrew Li of Applied Materials. The project was funded through the New York State Foundation for Science, Technology and Innovation. [Read more.](#)

Honors and Awards

Faculty

- [Sam Wait](#) (Associate Dean, School of Science; Professor, Chemistry) was elected President of the Board of Trustees of the Dudley Observatory, a position he has held in the past. In addition to being a Board member, he serves as the representative of Rensselaer's President who is a Board member Ex Officio. The Dudley Observatory, chartered by the State of New York in 1852, is the oldest independent organization in the country supporting research and education in astronomy and the history of astronomy. It has one of the finest collections of historically significant astronomical texts in its library, with rare books dating from as early as 1492. Locally the Dudley Observatory awards grants to fund educational programs serving schools and the community.

Alumni

- **Dork Sahagian** (B.S. in Physics, 1977) and **Robert Schock** (Ph.D. in Geology, 1966) are two Rensselaer School of Science alumni who are part of the organization that received the 2007 Nobel Peace Prize. The alumni are part of the Intergovernmental Panel on Climate Change (IPCC), which shared the international peace prize this past year with Al Gore, environmental policy leader and former U.S. vice president. [Read more.](#)

Research Accomplishments

- **Kristin P. Bennett** (Professor, Mathematical Science) gave the plenary talk, “Optimization and Machine Learning,” at the International Conference on Optimization Theory and Applications in Kobe, Japan.
- **Angel Garcia** (Senior Constellation Professor, Biocomputation and Bioinformatics; Professor, Physics, Applied Physics, and Astronomy) and **Henry Herce** (Research Associate, Physics, Applied Physics, and Astronomy) have uncovered what they believe is the long-sought-after pathway that an HIV peptide takes to enter healthy cells. The theorists analyzed two years of biocomputation and simulation data to uncover a surprisingly simple mechanism describing how this protein fragment penetrates the cell membrane. The discovery could help scientists treat other human illnesses by exploiting the same molecules that make HIV so deadly proficient. The findings are detailed in the Dec. 26, 2007, issue of the Proceedings of the National Academy of Sciences (PNAS). [Read more.](#)
- **Jim Hendler** (Constellation Professor, Tetherless World Constellation; Professor, Computer Science) was appointed a member of the advisory committee for the World Wide Web Consortium, the main standards body for the Web. Rensselaer has joined this consortium as a result of support from Fujitsu to the Tetherless World Constellation.
- **Shawn-Yu Lin** (Constellation Professor, Future Chips Constellation; Professor, Physics, Applied Physics, and Astronomy), working with researchers at Rice University, has created the darkest material ever made by man. The material, a thin coating comprised of low-density arrays of loosely vertically aligned carbon nanotubes, absorbs more than 99.9 percent of light and one day could be used to boost the effectiveness and efficiency of solar energy conversion, infrared sensors, and other devices. The researchers who developed the material have applied for a Guinness World Record for their efforts. The research results were published in the journal Nano Letters. [Read more.](#)
- **Wayne Roberge** (Professor, Physics, Applied Physics, and Astronomy) and **Glenn Ciolek** (Adjunct Professor, Physics, Applied Physics, and Astronomy) have used what they call “pen-and-paper math” to describe the motion of interstellar shock waves — violent events associated with the birth of stars and planets. The findings, published recently in the Monthly Notices of the Royal Astronomical Society, could provide astronomers with important information on the history of the solar system, the formation of stars, and the creation of chemicals that may have formed the basis for planets and even life on Earth. [Read more.](#)
- **Christian Wetzel** (Wellfleet Career Development Constellation Professor, Future Chips Constellation; Associate Professor, Physics, Applied Physics, and Astronomy) received a PARPA award related to green light research. The base contract is for 18 months and includes funding of \$1.4M. Two additional options of 18 and 12 months that include additional funding of \$1.4M and \$0.9M, respectively, bring the total to \$3.7M.
- **Ingrid Wilke** (Assistant Professor, Physics, Applied Physics, and Astronomy) and Suranjana Sengupta (Graduate Student, Physics, Applied Physics, and Astronomy) published a book chapter, “Nonlinear optical techniques for THz pulse generation and detection: Optical rectification and electrooptic sampling”, in the new book *Terahertz Spectroscopy: Principles and Applications*, edited by Susan L. Dexheimer and published by Taylor & Francis Group.
- **Mohammed Zaki** (Associate Professor, Computer Science) has been appointed Associate Editor for the journal Knowledge and Information Systems. Additionally, he is Program Co-Chair for the 8th SIAM International Conference on Data Mining, Atlanta, Georgia, April 2008 and Vice Program Chair for the 12th Pacific-Asia Conference on Knowledge Discovery and Data Mining, Osaka, Japan, May 2008. He and **Chris Bystroff** (Associate Professor, Biology) recently published a book that they edited, Protein

Structure Prediction, 2nd Edition, Methods in Molecular Biology, Vol. 413, Humana Press (Springer), 2008.

- **X.-C. Zhang** (J. Erik Jonsson '22 Professor, Physics, Applied Physics, and Astronomy) recently received a research contract from the Navy for about \$2.2M over three years. He also has three other grants from the Office of Naval Research with other faculty in the Physics, Applied Physics, and Astronomy department: \$0.75M with **Saroj Nayak** (Associate Professor), \$0.9M with **Masashi Yamaguchi** (Assistant Professor), and \$1.01M with **Michael Shur** (Patricia W. and C. Sheldon Roberts Professor).

Other News

- Rensselaer will once again open the refurbished Hirsch Observatory to the Rensselaer community and larger Capital Region community Friday evenings from Feb. 1 through mid-November. The more-than-65-year-old observatory, which sits atop the Jonsson-Rowland Science Center, will hold an open house every Friday evening 8-10 p.m. The program is held if it is clear or cloudy. Anyone from the community is invited to come. Children are welcome. "On a public observing night you will be able to look at nebula, a couple of galaxies, planets, the craters on the moon, the rings around Saturn, and other objects like that," says Heidi Newberg, associate professor of astronomy and observatory manager.
- The Physics, Applied Physics and Astronomy department hosted an informal gathering of Physics faculty on Wednesday, January 16th inviting them to the new "faculty lounge" established through support from the RAMP UP program. The faculty lounge will be open weekdays to check mail, chat with friends, or just relax. There will be a daily coffee hour from 3pm to 4pm and faculty are encouraged to stop by and enjoy a free cup of coffee or tea.
- **Attention Students:** Undergraduate students are encouraged to participate in the 2008 Undergraduate Research Forum and Awards (URFA) program on Friday, March 28. All undergraduates who are currently enrolled full-time for spring 2008 and are conducting a research project under the supervision of a Rensselaer faculty member are eligible to participate. The Forum is an opportunity for students to showcase their theoretical or applied research and to present a 3 to 5-minute oral presentation and poster to a panel of faculty judges. First-place winners in theoretical and applied categories will each receive a cash award of \$500, \$250 will be awarded to second-place winners and third-place winners will receive \$150. By March 3, students must submit a short abstract via the program website at <http://www.eng.rpi.edu/urfa/>. Students will receive notification of abstract acceptance by March 7.

Upcoming Events

- Annual Black Family Technology Awareness Day, Saturday, February 9, 2008.
- President's Day, no classes, staff holiday, February 18, 2008.
- Lemelson-Rensselaer Student Prize Ceremony, Biotech Auditorium, 2:00 pm - 2:30 pm, February 28, 2008.

This newsletter is prepared monthly and distributed to faculty, staff and students in the School of Science to keep everyone informed of accomplishments and events within the school. Corrections and items for the next newsletter should be sent to spoon@rpi.edu.

